

## ANCIENT EGYPTIAN CASE OF CARCINOMA \*

EUGEN STROUHAL, M.D., Ph.D.

Curator

Náprstek Museum of Asian, African, and American Cultures

National Museum

Prague, Czechoslovakia

**I**N the collection of ancient Egyptian skeletal remains from the cemetery at Naga-ed-Dêr, Upper Egypt, deposited at the Lowie Museum of Anthropology, University of California at Berkeley, Calif., I found, during a systematic survey of its anthropology and paleopathology in 1973, an interesting skull with intravital destruction of the facial skeleton.

### ARCHAEOLOGICAL BACKGROUND

Skull No. 12-5046 of the Lowie Museum collection was found in the cemetery labelled 100 at Naga-ed-Dêr in Upper Egypt. The site is part of a number of burial grounds, covering the period from predynastic to Coptic times, which were excavated during 1901 to 1903 by the Egyptian expedition, sponsored by Mrs. Phoebe Hearst and the University of California, under the direction of George Reisner. Cemetery 100 was situated apart from the others, northwest of the present village of Naga-ed-Dêr.<sup>1</sup> It consisted of almost totally plundered uninscribed rock-cut tombs dated sixth to 12th dynasties.<sup>1</sup> Cemetery 100 has not yet been described archaeologically.

According to Catalogue No. 12 of the Lowie Museum, the skull was found in the collective rock-tomb No. N 217, together with two other skulls of adult women (No. 12-5045, a 20-to-30-year-old and No. 12-5047, a 40-to-60-year-old) and a skull of a 14-to-15-year-old girl (No. 12-5044). In Catalogue No. 6, containing objects from cemetery 100, no objects have been listed under tomb No. N 217. According to Mrs. Caroline R. A. Peck, who has been studying the archaeology of the Naga-ed-Dêr cemeteries, no field notes concerning this grave have been preserved.

\*This research was supported in part by grant No. 2623 from the Wenner-Gren Foundation for Anthropological Research, Inc., New York, N.Y., and a grant from the Hrdlička Foundation, Smithsonian Institution, Washington, D.C.

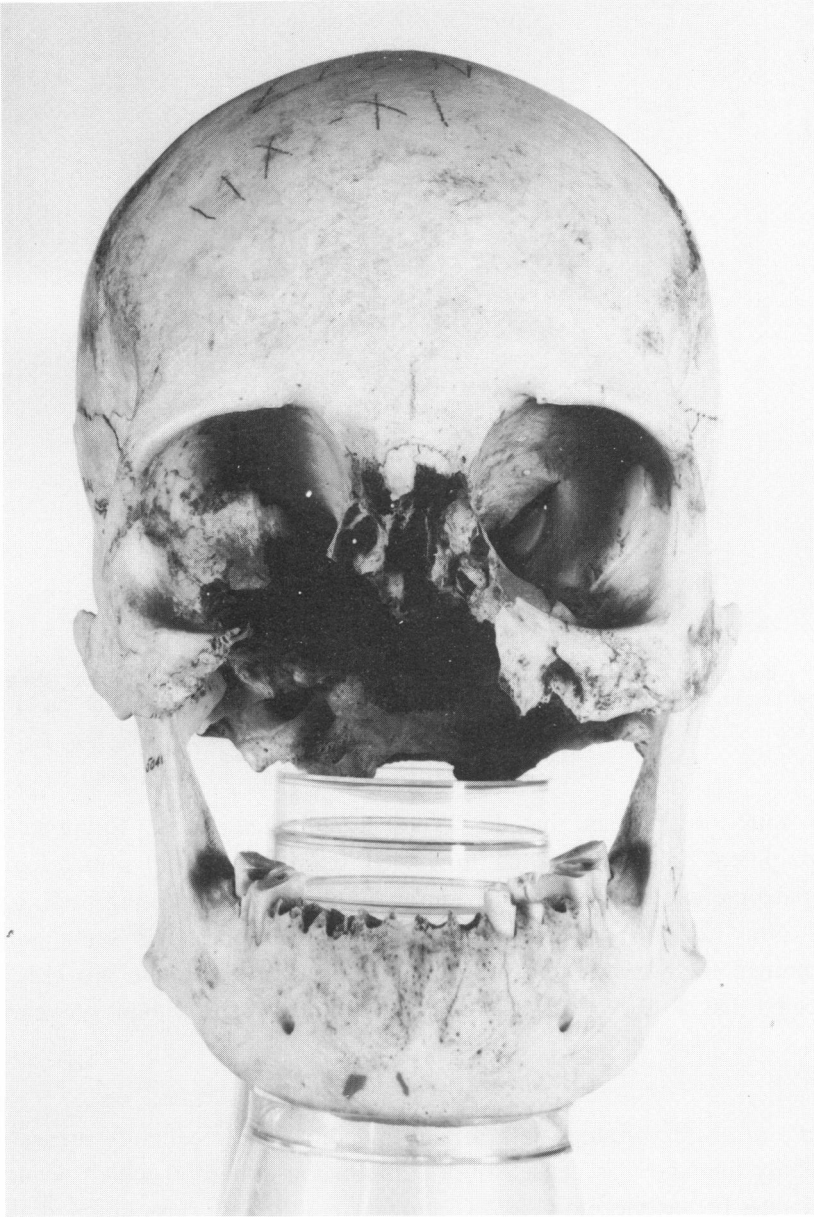


Fig. 1. Skull No. 12-5046, Lowie Museum of Anthropology, in frontal norm, showing the destruction of the facial skeleton. Photographed by E. Prince. Courtesy of the Lowie Museum of Anthropology, University of California, Berkeley.



Fig. 2. Skull No. 12-5046, Lowie Museum of Anthropology, in left lateral norm, showing the destruction of the facial skeleton. Photographed by E. Prince. Courtesy of the Lowie Museum of Anthropology, University of California, Berkeley.

In spite of the fact that R. Wood Leigh studied the Egyptian anthropological collection of the Lowie Museum, both from somatological and paleopathological viewpoints, no mention of the interesting findings in skull No. 12-5046 was included in his publication.<sup>2</sup> The same author determined the sex and age of the specimens for Catalogue No. 12. He indicated that skull No. 12-5046 belonged to a woman of about 45 years.

#### BASIC DEMOGRAPHIC DATA

*State of preservation.* The skull and mandible are excellently preserved. The only damage was caused by a pathological condition which occurred during the life of the individual (Figures 1 and 2). No postcranial skeletal material is available in the Berkeley collection.

*Age.* Because of the pathological condition, no upper teeth have been preserved. In the lower dentition all molars and the left first premolar and canine have been preserved in their sockets, other teeth being lost postmor-

## CRANIAL MEASUREMENTS AND INDICES OF INDIVIDUAL NO. 12-5046

	<i>mm.</i>
Maximum length of the skull (1)*	170
Nasion-basion length (5)	100
Maximum breadth of the skull (8)	124
Minimum frontal breadth (9)	92
Maximum frontal breadth (10)	109
Biauricular breadth (11)	110
Basion-bregma height (17)	130
Porion-bregma height (20)	109
Horizontal circumference of the skull (23)	478
Transverse curve (24)	290
Sagittal curve (25)	348
Bizygomatic breadth (45)	121
Anterior interorbital breadth (50)	18?
Orbital breadth (51)	41
Orbital height (52)	37
Bicondylar breadth of the mandible (65)	111
Bigonial breadth of the mandible (66)	101
Mandibular length (68, 1)	111
Symphyseal height (69)	35
Height of the body (69, 1)	34
Thickness of the body (69, 3)	11
Height of the ascending ramus (70)	63
Minimum breadth of the ascending ramus (71)	34
Gonial angle (79)	131
<hr/>	
Cranial index (I 1)	72,9
Height-length index (I 2)	76,5
Height-breadth index (I 3)	104,8
Transversal frontal index (I 12)	84,4
Transversal frontoparietal index (I 13)	74,2
Orbital index (I 42)	90,2
Mandibular index (I 62†)	100,0
Ascending ramus index (I 63)	54,0
Thickness of the mandibular body index (I 66)	32,4

\*Numbers in parentheses refer to the techniques of Martin and Saller.<sup>4</sup>

† = modified: with 68,1 instead of 68

tem (Figures 1 and 2). The degree of attrition is advanced. The first molars have half of the crown height abraded, the pulp cavity being filled with secondary dentine. The first premolar and canine show abrasion of enamel and exposure of dentine. On the second molars some enamel bridges remain. On the third molars dentine is visible as points or narrow bands. The retraction of the alveolar border reaches stage 2 of Brothwell's division.<sup>3</sup> There are no deposits of calculus on the preserved teeth. Cranial sutures are still open, except the fully closed, lowest parts of the coronal suture (C<sub>3</sub>) and starting closure at the obelic part of the sagittal suture (S<sub>3</sub>).

No signs of senility are present. All features point to the age as being 35 to 45 years.

*Sex.* The skull as a whole is medium robust (Figures 1 and 2) and has comparatively small dimensions (see table). The glabella (Broca 1-2)<sup>4</sup> and arcus superciliares (Eickstedt 1-2)<sup>5</sup> are feebly developed. The lineae temporales are not developed at all, the crista supramastoidea only slightly. The protuberantia occipitalis externa is small (Broca 2),<sup>4</sup> the processus marginalis Sömmeringi medium, and the occipital muscular relief medium also. The forehead is straight and vertical, and curves abruptly in its higher part. The mandible is of medium robusticity and has a medium expressed muscular relief, but with clear eversion of mandibular angles. The chin is square with marked mental tubercles and only moderately developed protuberance. The evidence of sex is ambiguous; the calvarium shows female features while the mandible is more masculine. Because tomb N 217 was collective and its description is missing, we cannot reject completely the possibility that the mandible belonged to some other individual, a male whose calvarium has not been preserved. The other two preserved adult calvaria from the same tomb are female. However, the mandible fits well in the temporomandibular joint. In view of this situation, the calvarium is thought to be female.

#### DESCRIPTION OF THE LESIONS

The greater part of the facial skeleton except the orbits (Figures 1 and 2) and the sphenoid region of the base of the skull (Figure 3) were destroyed by the growth of an expanding pathological process, most probably a tumor. According to the distribution of the destruction and assuming basically symmetrical globular growth of the tumor, it seems likely that the center of the tumor was located in the nasopharyngeal region or epipharynx, slightly to the right of the sagittal plane. The expanding tumor did not cause smooth withdrawal of the bony structure by pressure, characteristic of a benign neoplasm, but acted osteolytically and eroded the osseous margins, which are irregular and rarified. At the same time the osseous tissues were irritated to a not very productive osteoplastic reaction consisting of excrescences, honeycombs, and cicatrix appearances. The malignant character of a tumor would explain these changes. All observed lesions were produced from the outer side of the calvarium, excluding any possibility that the tumor had originated intracranially.

The entire nasal skeleton up to the root was destroyed by the tumor

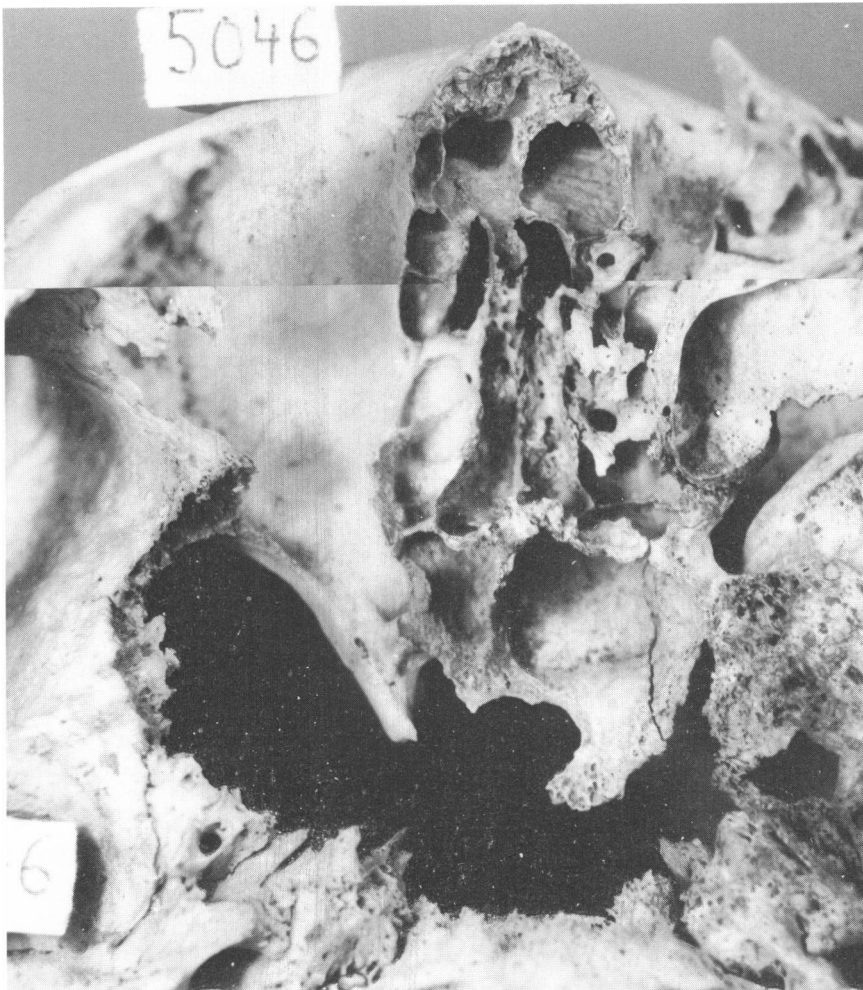


Fig. 3. Detail of the basal view of the same skull, showing the destruction of the sphenoid and nasal regions. Photographed by E. Strouhal.

(Figure 3). The entrances of both frontal sinuses are largely open at their bases. The right ethmoidal labyrinth is missing and the foveolae ethmoidales of the frontal bone are uncovered and eroded. From the left ethmoidal labyrinth eroded remnants of its uppermost parts have been preserved. The anterior third of the lamina cribrosa is almost missing and there are two perforations into the anterior cranial fossa.

The entire right wall and a great part of the left medial wall of the orbits were destroyed by the tumor (Figure 1). Almost the entire maxilla and both palatal bones are missing. It is not possible to say whether they were devoured completely by the progressing tumor or whether they were merely separated by the tumorous tissue and their remnants lost. Only a small part of the left maxilla, including the lower wall of the left orbit, remained in situ. The medial and lower edges of this fragment are cicatrized; the upper portion of the broadly gaping maxillary sinus is uncovered within it. On the right side the lower medial wall of the orbit is missing. Only a tiny cicatrized fragment of maxilla with a minute tip of the maxillary sinus remains in situ next to the right zygomaxillary suture. Periosteal reaction, manifested by the roughened surface of the bone, reached 10 mm. farther laterally on the lower edge of the right zygomatic bone. All this clearly shows the greater progression of the tumor on the right side.

Both the vomer and pterygoid processes of the sphenoid bone had disappeared (Figure 3). The tumor had destroyed the anterior half of the basilar part of the occipital bone and had penetrated far into its spongy tissue, reaching the compact inner table, which shows nine minute perforations. The spongy structure, rebuilt, resembles a honeycomb. The described changes clearly show that the tumor had grown from below upward. The corpus of the sphenoid bone was eroded from the same direction; this is shown by its partially preserved anterior part (Figure 3). The outer compact table is missing and only the upper fundus of the sphenoid sinus, largely gaping, has been preserved. The remnant of the right lateral wall of the corpus and the septum of the sphenoid sinuses are eroded and roughened horizontally.

The base of the skull is largely perforated at the site of the completely destroyed posterior part of the body of the sphenoid (with two circular projections in its anterior part) and at the site of both greater wings (Figure 3). Only a small portion of the right greater wing containing the foramen rotundum and situated in the angle between the sphenoidal margin of the temporal bone and the pyramid remained in situ. The sphenoidal margin of the right temporal bone has a rugged surface, marked by excrescences, craters, and sclerotic areas. On the left side the perforation in the greater wing is smaller and has a narrow projection directed forward and another small hole laterally, close to the left foramen rotundum. The remaining surface of the left greater wing is largely eroded and shows excrescences



Fig. 4. Detail of the right squama temporalis with a honeycomb eruption of a probable secondary deposit. Photographed by E. Strouhal.

and honeycomb structure. The changes at the base of the skull, as well as the changes in the face, demonstrate the greater extent of the tumor toward the right side.

Honeycomb formation is seen on the external surface of the right temporal squama, 16 mm. behind the spheno-squamous suture and 15 mm. downward from the squamous suture (Figure 4). It covers a roughly oval area (sagittally: 8 mm., vertically: 9 mm.) and projects about 2.5 mm. above the surrounding surface. The squama, however, is not perforated. In the osseous structure there is no visible connection between this—most probably a secondary deposit—and the principal large area of destruction.

The described changes in the facial skeleton can be checked, together with changes in the skull base, in the axial projection (Figure 5). It clearly shows the extent of the defects and the relatively feeble osteoplastic reaction.





Fig. 5. Skull No. 12-5046, Lowie Museum of Anthropology, in an axial radiograph, showing the extent of the destruction with feeble osteoplastic reaction. Radiographed by J. Gregory. Courtesy of the Paleontological Museum, University of California, Berkeley.

## EVALUATION OF THE FINDINGS

The described large destructions of skull No. 12-5046 were most probably caused by a tumor. Other possible causes, such as necrosis resulting from poisoning of heavy mineral salts, noma, and other infections, can be excluded because of their different morphology.

It has been shown that all the described defects in the facial skeleton as well as in the base of the skull, excluding the small lesion at the right temporal squama, were parts of a single pathological process. The eroded and remodelled edges of the defects do not favor primary or secondary bone tumor. More probably a tumor of soft tissues, primary or metastatic, should be taken into account. The malignant infiltration of tumor tissue into the bone was revealed by the poorly delimited borders of the destruction and the predominance of osteolytic changes over osteoplastic reaction. This reflects the proteolytic function of the tumor cells. With regard to the age of the individual—35 to 45 years—carcinoma would be the most obvious choice.

It was shown that the center of the tumor could be localized in the epipharynx, somewhat to the right of the sagittal plane. Supposing that the center was at or near the place of origin of the tumor, primary carcinoma of the nasopharynx would be the most prominent possibility. Other causes cannot be excluded, e.g., tumors of the adjoining nasal cavities such as malignant papilloma, tumors of the oral cavity, such as destructive cystic adenocarcinomas, or pharyngeal tumors.<sup>6</sup> Intracranial tumors such as craniopharyngeoma or hypophyseal tumors which originate in the destroyed regions seem improbable because of the direction of the lesions from the outer side of the calvarium. Metastases of other kinds of carcinoma into the nasopharynx are extremely rare.

Tumors of nasopharyngeal or oral origin are somewhat common; according to Martin and Blady,<sup>7</sup> they account for 2% of all malignant tumors. According to Walther,<sup>8</sup> 90% of nasopharyngeal tumors destroy the base of the skull and the hard palate.

The large size of the tumor, which caused such extensive destruction, suggests a relatively long-lasting process, during which metastases could be produced. The small lesion at the right temporal squama could be one of them. Unfortunately, the postcranial skeleton, in which other metastases could have been located, is missing.

The patient seems to have survived for a considerable time, and doubtless had pain and other symptoms. Survival would be impossible without

the help and care of the patient's fellow-men. This fact reflects an important sociological feature of the ancient Egyptian civilization in the period from c. 2350 to 1786 B. C.

### DISCUSSION

Carcinoma of the nasopharyngeal region has been described in three other cases from ancient Egypt. A destructive process at the base of the skull, similar to this case, was published by Derry<sup>9</sup> in an X-group (pre-Christian, fourth to sixth centuries A.D.) skeleton from Nubia. The base of the occipital bone, the sphenoid, vomer, posterior parts of the palate, and the nasal conchae were missing. The margins of the defect were irregular and rarified. No doubt the destruction was the result of an osteolytic malignant process; according to Smith,<sup>10</sup> it had originated in the nasal mucous membrane or sphenoid sinus. This seems to be the same as the case mentioned as epithelioma of the nasopharynx by Smith and Dawson.<sup>11</sup> The picture of the specimen was reproduced by Brothwell.<sup>12</sup>

A similar case was published by Wells.<sup>13</sup> The skull was that of a 30-to-35-year-old man of the third to fifth dynasties; it is deposited at the Duckworth Laboratory in Cambridge. A primary tumor of soft tissues of the left nasal or nasopharyngeal region had destroyed the posterior part of the alveolar process of the upper jaw, with loss of second and third molars, the posterior half of the hard palate, the medial and lateral pterygoid laminae, the posterior wall of the maxillary sinus, and part of the inferior concha. Twenty-six circular lesions found mainly in the cranial vault but also found in other parts of the skull by inspection, x-ray examination, and translumination could be interpreted as secondary bony metastases of the primary carcinoma, although the author did not exclude the possibility of multiple myeloma.

Recently another case of nasopharyngeal carcinoma was reported by El-Rakhawy et al.<sup>14</sup> in a 30-to-35-year-old male from the Christian cemetery, dated  $500 \pm 100$  A.D., at El-Bersha in Menya province, Upper Egypt. The erosion was situated at the right side of the nasopharynx: the floor of the pterygoid fossa had opened into the maxillary sinus. The patient must have been afflicted by severe pains, as suggested by a piece of linen cloth found in the right auditory meatus.

Our finding, described above, exceeded the other published cases in the extent of the lesions; however, the localization and morphological pattern were similar.

## SUMMARY

During a systematic survey of skeletal material obtained at Naga-ed-Dêr, Upper Egypt, and deposited in the Lowie Museum of Anthropology at Berkeley, Calif., a skull showing extensive intravital destruction was found. It originated from tomb No. 217 (sixth to 12th dynasties). The greater part of the facial skeleton, except the orbits, and the sphenoid region of the base had been destroyed, most probably by a tumor originating in the soft parts of the nasopharyngeal region. The margins of the eroded bones reveal the prevailing osteolytic and malignant nature of the tumor. Primary carcinoma of the nasopharynx seems the most probable cause. A small lesion on the external surface of the right squama is probably a secondary deposit.

## ACKNOWLEDGMENTS

It is my pleasure to thank Mrs. Lita Osmundsen, director of research at the Wenner-Gren Foundation for Anthropological Research, New York, N.Y., and Dr. J. Lawrence Angel, head of the Subdivision of Physical Anthropology at the Smithsonian Institution, Washington, D.C., for their kind support of my work. I was most graciously accepted by the staff of the Lowie Museum and I appreciate the help of Dr. Frank A. Norick, principal museum anthropologist, of Mr. David D. Herod, senior curatorial anthropologist, and of other colleagues there. For providing x-ray pictures I am indebted deeply to Dr. Joseph Gregory, director of the Paleontological Museum of the University of California, Berkeley. For the views of the skull I thank Mr. Eugene Prince, photographer at the Lowie Museum. I discussed the finding with Dr. Miroslav Kolâr and Dr. Luboš Vyhnanek, both from the Radiological Clinics, Medical Faculty of Charles University, Prague; with Dr. Věroslav Pazderka from the First Institute of Pathology of the same university; and with Dr. Emanuel Vlček from the Anthropological Department, National Museum, Prague. I am grateful for their suggestions. For additional information on the archaeological dating I extend my thanks to Mrs. C. R. A. Peck, Jr., of Providence, R.I.

## REFERENCES

1. Reisner, G.: *The Early Dynastic Cemeteries of Naga-ed-Dêr*. Part I. Leipzig, Hinrichs, 1908, vol. 2, esp. Planche 79.
2. Leigh, R. W.: *Notes on the Somatology and Pathology of Ancient Egypt*. Ber-

- keley, Calif., University of California Press, 1934, vol. 34, pp. 1-54.
3. Brothwell, D. R.: *Digging up Bones*. London, British Museum of Natural History, 1963.
4. Martin, R. and Saller, K.: *Lehrbuch der Anthropologie*, 3d ed. Stuttgart, Fischer, 1959, vol. 2.
5. Eickstedt, E. F. von: Physiologische und morphologische Anthropologie. In: *Die Forschung am Menschen*. Stuttgart, Enke, 1944, part 2.
6. Burkhardt, I., and Fischer, H.: Pathologische Anatomie des Schädels. In: *Handbuch der speziellen pathologischen Anatomie und Histologie*, Uehlinger, E., editor. Berlin, Heidelberg, and New York, Springer-Verlag, 1970, vol. 9, part 7.
7. Martin, H. E. and Blady, J. V.: Cancer of nasopharynx. *Arch. Otolaryngol.* 32:692-727, 1940.
8. Walther, H. E.: *Krebsmetastasen*. Basel, Schwabe, 1948.
9. Derry, D. E.: Anatomical report. *Bull. Archaeol. Survey Nubia* 3:29-52, 1909.
10. Smith, G. E.: Anatomical report. *Bull. Archaeol. Survey Nubia* 4:19-21, 1909.
11. Smith, G. E. and Dawson, W. R.: *Egyptian Mummies*. London, Allen and Unwin, 1924, p. 157.
12. Brothwell, D. R.: The Evidence for Neoplasms. In: *Diseases in Antiquity*, Brothwell, D. and Sandison, A. T., editors. Springfield, Ill., Thomas, 1967, chap. 24, pp. 320-45, fig. 9c.
13. Wells, C.: Ancient Egyptian pathology. *J. Laryngol. Otol.* 77:261-65, 1963.
14. El-Rakhawy, M. T., El-Eishi, H. I., El-Nofely, A., and Gaballah, M. F.: A contribution to the pathology of ancient Egyptian skulls. *Anthropologie* (Brno) 9:71-78, 1971.